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USSR Report

CHEMISTRY



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/9835

ANALYTICAL CHEMISTRY

UDC 543:422

EFFECT OF ORGANIC SOLVENTS ON ATOMIC ABSORPTION OF ELEMENTS IN LOW TEMPERATURE FLAME

Tashkent UZBEKSKIY KHIMICHESKIY ZHURNAL in Russian No 1, Jan-Feb 86
(manuscript received 4 Feb 85) pp 3-5

[Article by I.M. Nurmatov and R.Kh. Dzhiyanbayeva, Tashkent Order of Labor Red Banner State University imeni V.I. Lenin]

[Abstract] Published data on the changes in increased sensitivity of flame photometric determination of elements dispersed in various organic solvents are often contradictory. In the present work a study of the absorption spectra of flame photometry of iron, cadmium, magnesium, copper and nickel in n-butanol, iso-amyl alcohol, iso-propanol, acetone and ethyl acetate shows that the aperture size of the condenser system of serially-produced spectrophotometers is a critical factor owing to the variations in flame size and the distribution of element concentrations over different parts of the flame. Reference 1 (Western).

12765/9835
CSO: 1841/568

UDC 543.53:546.9

STUDY OF MICROCONCENTRATIONS OF NOBLE METALS WITH RADIOACTIVATION METHOD

Tashkent UZBEKSKIY KHIMICHESKIY ZHURNAL in Russian No 1, Jan-Feb 86
(manuscript received 13 Jun 85) pp 6-7

[Article by A.G. Ganiyev and D.U. Karimkulov, Institute of Nuclear Physics, UzSSR Academy of Sciences]

[Abstract] A review of Soviet work on radioactivation analytical techniques for detection of macro- and microquantities of noble metals in ores, meteorites and industrial wastes covers five references by Ganiyev and coworkers from 1970 to 1980 of work done at the Institute of Nuclear Physics, UzSSR Academy of Sciences. Currently, work is progressing on

both nuclear physical and radioanalytical methods, especially variations of X-ray-fluorescent analysis and isotope dilution. Research has also recently been initiated on ion-selective electrodes. References 5 (Russian).

12765/9835
CSO: 1841/568

UDC 593.544.42:546.77

SEPARATION AND DETERMINATION BY THIN LAYER CHROMATOGRAPHY OF Cu, Co, Ni, Zn, Cr, Fe AND V ON CELLULOSE SORBENT CONTAINING AZOPYROCATECHIN GROUPS

Moscow ZHURNAL ANALITICHESKOY KHMII in Russian Vol 41, No 4, Apr 86
(manuscript received 30 Apr 85) pp 662-665

[Article by G.V. Myasoyedova, M.P. Volynets, T.G. Akimova, L.I. Bolshakova, T.V. Dubrova, S.B. Savvin and A.N. Yermakov, Institute of Geochemistry and Analytical Chemistry imeni VII. Vernadskiy, USSR Academy of Sciences, Moscow]

[Abstract] Small quantities of metals are frequently determined by preliminary enrichment on a sorbent followed by a color reaction. Modified cellulose sorbents have been used for the rapid detection of palladium, silver and other metals in complex solutions. In the present work, optimum conditions were determined for the simultaneous separation and semiquantitative determination of the title transition metals on a chelate-forming cellulose sorbent containing azopyrocatechin groups by thin-layer chromatography. The elements are determined by color reaction in the sorbent zone. A rapid semi-quantitative method was developed for detecting heavy metal ions present in electroplating effluent containing 20-400 mg/l of heavy metals. The method is sensitive to 0.05-2 micrograms in the sorbent zone. Figure 1; references 10: 6 Russian, 4 Western.

12765/9835
CSO: 1841/564

UDC 543.253.548.8

POLAROGRAPHIC DETERMINATION OF CHROMIUM (III) AND (VI) IN NATURAL WATERS

Moscow ZHURNAL ANALITICHESKOY KHMII in Russian Vol 41, No 4, Apr 86
(manuscript received 25 Mar 85) pp 686-691

[Article by L.Ya. Kheyfets, A.Ye. Vasyukov, L.F. Kabanenko and A.V. Cherevik,
All-Union Scientific-Research Institute for Water Protection, Kharkov]

[Abstract] While Cr (III) and (VI) can be determined polarographically, the required conditions are not suitable for detecting Cr (III) in the presence of Cr (VI) nor for determining both in natural water to PDK limits (maximum permissible concentration). The concentration limits for detection may be lowered by using differential chronoamperometry with a dropping mercury electrode and linear involution of the potential and catalytic currents. In the present work, the characteristics of the Cr (III) and Cr (VI) waves in various polarographic variants are compared and it is demonstrated that only differential chronoamperometry is needed for direct Cr (VI) determination to PDK levels, and catalytic currents in any polarographic form may be used for Cr (III) determination. The proposed methods make it possible to determine both Cr (III) in the presence of a large excess of Cr (VI) and vice versa. Figures 3; references 6 (Russian).

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CSO: 1841/564

UDC 543.272:546.292.54.492

GAS CHROMATOGRAPHIC ANALYSIS OF HIGH PURITY HELIUM USING A HELIUM DETECTOR

Moscow ZHURNAL ANALITICHESKOY KHMII in Russian Vol 41, No 4, Apr 86
(manuscript received 15 Nov 84) pp 696-701

[Article by V.A. Krylov, S.D. Aleksandrov, S.G. Krasotskiy, A.K. Chernyatin and T.V. Shkrunina, Institute of Chemistry, USSR Academy of Sciences, Gorkiy]

[Abstract] Progress in the production of high purity helium is contingent on the effectiveness of analytical procedures, especially in lowering the limits of determination and providing reliable results. Highly pure helium is analyzed by preliminary enrichment of the impurities coupled with a heat conductivity detector by which it is possible to detect impurities at the 10^{-4} - 10^{-6} level. Impurity enrichment, however, can lead to unreliable results. In the present work a helium ionization detector was used in conjunction with saturation current conditions provided by cryogenic adsorption. It was demonstrated that the limits of detection are restricted by the gas permeability of the teflon detector housing and the inlet system. The relative limit of detection was reduced to 3×10^{-5} for

neon and $4 \times 10^{-7}\%$ to $2 \times 10^{-8}\%$ for hydrogen, oxygen, argon, nitrogen, krypton and methane by using the preliminary enrichment technique. Figures 3; references 10: 6 Russian, 4 Western.

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UDC 543.544:543.852

GAS CHROMATOGRAPHIC DETERMINATION OF HIGHER FATTY ACIDS IN BLOOD PLASMA USING GLASS CAPILLARY COLUMNS

Moscow ZHURNAL ANALITICHESKOY KHMII in Russian Vol 41, No 4, Apr 86
(manuscript received 2 Jan 84) pp 713-716

[Article by A.Ye. Zorin, B.A. Rudenko, D.N. Dzhabarov, V.V. Kulebakina and V.V. Pomazanov, First Moscow Medical Institute imeni I.M. Sechenov]

[Abstract] The qualitative and quantitative higher fatty acid composition of blood plasma may serve as an indicator of the physiological status of the body, while any change in composition may be used diagnostically. Fatty acids are normally determined by preliminary conversion to methyl esters with various methylating agents. Many of the agents used, however, are very toxic and the reactions require much time. In the present work the fatty acids were esterified by pyrolytic splitting off of tetr-amethylammonium salts directly in polydimethylsiloxane-filled glass capillary tubes of a gas chromatograph evaporator. The limit of detection was 0.1 microgram from a plasma sample of 1 ml and the time for the analysis was 40 minutes. Figures 2; references 15: 6 Russian, 9 Western.

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CSO: 1841/564

UDC 543.544.45:547.551.42

DETERMINATION OF RAMROD IN WATER BY GAS-LIQUID CHROMATOGRAPHY

Moscow ZHURNAL ANALITICHESKOY KHMII in Russian Vol 41, No 4, Apr 86
(manuscript received 28 Jan 85) pp 717-720

[Article by V.Ye. Kirichenko, K.I. Pashkevich and S.A. Glebova, Institute of Chemistry, Ural Scientific Center, Sverdlovsk]

[Abstract] Ramrod (N-isopropyl-alpha-chloroacetanilide), a widely used selective herbicide for onions, cabbage, corn and soya, has a maximum permissible concentration of 0.01 mg/l in water and none at all in fish ponds. While Ramrod can be determined by thin layer chromatography,

gas-liquid chromatography and polarography, these known methods require considerable sample enrichment and special treatment of the solvents. In the present work, Ramrod was determined by gas-liquid chromatography directly in water by preliminary alkaline hydrolysis to N-isopropyl-alpha-hydroxyacetanilide and acylation of the latter with heptafluorobutyraldehyde. The limit of detection was 0.0005 mg/l. Figures 2; references 7: 4 Russian, 3 Western.

12765/9835
CSO: 1841/564

CATALYSIS

POLYMERS DESIGNED TO PICK UP VALUABLE METALS

Baku BAKINSKIY RABOCHIY in Russian 4 Jun 86 p 2

[Article by G. Aleskerov, scientist and presidium secretary of the Azerbaijan Academy of Sciences: "Trap for Metals"]

[Text] The Basic Directions of Economic and Social Development of the Country put forward the task of ensuring radical development of the production of modern polymer materials. In order to realize this it is necessary to step up basic research and see to it that the results achieved are rapidly adopted in practice. This principle guides the collective of the Azerbaijan Academy of Sciences Institute of Theoretical Problems of Chemical Technology, where important stages of a promising development are completed.

First a little about the materials that the researchers have been working with. Strictly speaking, their work is devoted to new principles of producing certain polymer sorbents and catalysts with what are known as structurized [strukturno-nastroyennyye] active centers. I believe that we should not only define our terms but also establish the places that chemical materials hold in a "table of ranks." Sorbents are substances which are capable of absorbing gases, vapors, and dissolved substances--in other words, capable of separating mixtures with many components. A gas mask is one example. A sorbent is used in it in order to remove undesirable contaminants from gas mixtures. Activated carbon is usually used.

In our industrial age it is difficult to find a field of human activity where it is possible to get along without sorbents. People are used to using water from the tap and do not often think about the state of the lake or river from which it comes. Sorbents, above all, are what makes it pure. They are necessary for desalinizing, softening, and distilling sea water so that it can be used for technical needs. Sorbents have done a good job in cleaning up oil spills on the surface of the sea. This is attested by the worldwide practice of ecological services. A number of examples, not arbitrarily chosen, have now been put together. This should convince you how important it is to pay attention to sorbents for anyone connected with one of the most significant and urgent problems of science in the republic--the problem of the Caspian.

But we are not talking about other tasks right now. Here we must distinguish a large class of sorbents which have the name ionites. They got this name because they exchange ions with substances that they interact with. Ionites basically come from mineral sources, they are widespread in nature, but nevertheless scientists have created a method to obtain them artificially, accomplishing the synthesis of ion-exchange polymers. What for? Synthetic ionites have a higher exchange capacity and more rapid rate of exchange, which means, ultimately, that they can be given any form--granules, fibers, membranes, tubes, and so forth. Thus, polymer ion-exchange sorbents were born.

They have a multitude of practical uses. They are needed to extract valuable components from complex mixtures, and used in chemical catalysis, the synthesis of inorganic and organic drugs, the manufacture of artificial soils, and other processes. Polymer sorbents are used in various sectors of industry, agriculture, and medicine. They have great possibilities in creating low-waste and waste-free technological processes. They have a great role in purifying industrial and consumer wastewaters, and the wastes of various production processes.

But, this appears to be enough to tell about sorbents as a whole, now it is time to define the nature of the research done by scientists in the Azerbaijan Academy of Sciences Institute of Theoretical Problems of Chemical Technology. Above all, they have interested themselves in the ability of polymer ionites to separate valuable metals which are dissolved in water and industrial wastewaters in the form of salts. Or in the solutions which form in the processing of various ores. Naturally, in all cases the metal is right next to admixtures of other elements. This means that the degree of selectivity of the sorbents is of the utmost significance. But scientists are now able to control this. More and more serious attention is being given to the problem of producing sorbents with the desired properties of selectivity. This problem was worked on by the collective of a laboratory led by Dr of Chemical Sciences A. Efendiyev. Prolonged research brought success.

Conventional solutions boiled down to introducing special groups, known as complex-forming groups, into the sorbents. These groups would trap the metal by forming complex compounds with it. But this customary method is not very effective. The problem is that the macromolecular networks of the sorbents are not constructed exactly as required by one metal or another. And its ions often are not "forced into" the structure of the networks, most often passing them by. This is how the task took shape: to change the macromolecules of a sorbent. It was accomplished as follows. While the polymer is still in solution and its macromolecules are still capable of sufficient movement, ions of the metal which it is supposed to trap are inserted into it. A sort of "reorganization" occurs. The molecules assume a useful position which then can be fixed by certain techniques. Then the metal ions are washed out of the polymer. But the task is already complete--the macromolecules have memorized their arrangement.

In this manner traps for copper, cobalt, nickel, and other metals are created in the laboratory. In Nizhniy Tagil, on the recommendations of Azerbaijani scientists, an experimental batch of sorbent has been produced which is undergoing testing in various regions of the country.

"What are the future plans of your laboratory, what direction will the research take now?" I asked A. Efendiyev.

"Above all, to create new sorbents for extracting valuable elements from industrial and natural waters, particularly those in our republic. There are also other tasks which at first glance seem to be more matter-of-fact but are also very important. For example, the creation of special sorbents to remove trace metals from vegetable oils. The problem is that nickel and copper are present in tiny amounts in cotton, sunflower, soy, and other vegetable oils. Although they are harmless due to their very small concentrations, they still substantially accelerate the process of oxidation of the oil--it "gets rancid," as the people say. Removing these trace metals makes it possible to increase by many times the storage life of oils. We are working on this at the request of the food industry workers, jointly with the laboratory of surface-active polymers of the USSR Academy of Sciences Institute of Petrochemical Synthesis imeni A. V. Topchiyev.

"And, finally, the laboratory will direct a great deal of effort toward creating a special group of catalysts," A. Efendiyev continued. "A restructuring principle which we developed is making it possible to substantially increase the effectiveness of metal-complex catalysts obtained based on polymer sorbents. Thanks to a configuration of the macromolecular networks which is suited to the metal, the metal is not washed out during the catalytic process, and this makes it possible to increase the service life of these catalysts. In addition, a number of additional operations can be carried out so that the macromolecules are constructed not only for a metal but also for raw materials which in the future will be used to produce various products by the catalytic method. A substantially higher activity of the catalyst is obtained, and, what is especially important, greater selectivity of the catalytic process. And this, as is well known, is the necessary precondition for creating low-waste and waste-free technological processes."

"Now I would very much like to look into the future, to imagine it. Could you?"

"Well, I will try. Imagine a pipe of gigantic diameter placed in the sea. Inside it--a structure which reminds one of honeycombs with vast cells, in each of which there is a sorbent constructed for the corresponding element of Mendeleyev's table. The seawater, as is well known, contains virtually a bouquet of these elements. The energy of the waves will provide, free of charge, an almost continuous flow of water through the tube. Then it remains only to take out the appropriate cells at a specified time and gather in the 'harvest.' Then there will begin a period of improving the technology and striving for greater and greater 'harvests.'"

I am convinced that much of what the scientists have thought up will become a reality. And in the very near future. But for now I will simply report that the work was approved by the presidium of the republic academy of sciences, and A. Efendiyev's paper about it was recommended for presentation in the USSR Academy of Sciences.

12255
CSO: 1841/572

UDC 547.539+547.26

TETRAKIS(TRYETHYLPHOSPHITE)Ni(O)--CATALYST FOR REACTION OF ARYL HALIDES WITH TRIALKYLPHOSPHITES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 56, No 4, Apr 86
(manuscript received 22 Apr 85) pp 959-960

[Article by Ye.A. Krasilnikova, I.V. Berdnik, V.V. Snetsov, F.Sh. Shagvaleyev and T.V. Zykova, Kazan Chemical-Technological Institute imeni S.I. Kirov]

[Abstract] The title compound was found to be a new catalyst for the reaction of aryl halides with trialkylphosphites. The reaction is assumed to proceed in two stages. Oxidative addition of the aryl halide to the Ni(O) complex occurs in the first stage which is followed by reductive elimination with regeneration of the catalyst in the second stage. The resulting unstable phosphonium salt is an intermediate product of the Arbuzov reaction, which apparently decomposes in accordance with the second stage of the Arbuzov reaction. The reaction mechanism was confirmed with NMR spectroscopy. References 6: 3 Russian, 3 Western.

12765/9835
CSO: 1841/570

UDC 541.128.13:541.183:547.261:546.62'56'47

METHANOL CONVERSION OVER COPPER-CONTAINING CATALYSTS FOR METHANOL SYNTHESIS

Moscow KINETIKA I KATALIZ in Russian Vol 27, No 2, Mar-Apr 86
(manuscript received 10 Jul 85) pp 352-357

[Article by L.A. Vytnova and A.Ya. Rozovskiy, Institute of Petrochemical Synthesis imeni A.V. Topchiyev, USSR Academy of Sciences, Moscow]

[Abstract] Methanol reacts with the surface of copper-zinc-aluminum methanol catalysts (type SNM) to form a variety of products depending on the temperature. At 120°-180°, methyl formate, dimethyl ether and hydrogen are formed, while at 220°-280° the products are chiefly carbon dioxide,

hydrogen and methane. Data, obtained during stationary methanol decomposition, led to the conclusion that methanol decomposes over metals and various oxides into hydrogen, carbon monoxide and/or formaldehyde, or into carbon dioxide and hydrogen if water is present. In the present work under non-stationary conditions at 250° over SNM-1 catalyst, it is shown that methanol reduces the catalyst surface to form carbon dioxide and hydrogen. The CO₂ is capable of oxidizing the methanol-reduced catalyst sites to form CO so that the end products of stationary methanol decomposition at 250° are CO and H₂. Methanol reacts with the surface of SNM-1 catalyst to form reduced sites capable of methane synthesis. Ways were determined to convert the chemisorbed methanol. Figures 3; references 10: 5 Russian, 5 Western.

12765/9835
CSO: 1841/562

UDC 541.128.13:541.183:542.941.7:546.262.3-31:546.98'72'623

HYDROGENATION OF CO OVER Pd-Fe/ γ -Al₂O₃ CATALYSTS

Moscow KINETIKA I KATALIZ in Russian Vol 27, No 2, Mar-Apr 86
(manuscript received 29 Aug 85) pp 358-363

[Article by G.D. Zakumbayeva, A.M. Dostiyarov, V.A. Naydin, V.F. Vozdvizhenskiy, T.S. Bagirov and A.Sh. Kuanyshov, Institute of Organic Catalysis and Electrochemistry, KaSSR Academy of Sciences, Alma-Ata]

[Abstract] Much attention has recently been devoted to improving carried and bulk iron catalysts for CO hydrogenation by introducing noble, alkaline and other metals. It has been specifically proposed that, by adding a platinum group metal to the catalyst, the degree of iron reduction during hydrogen treatment may be increased. However, in the case of bimetallic carried catalysts, significant changes can occur in metal-carrier and metal-metal interactions as a result of heteronuclear clusters on the surface. A study was made of CO hydrogenation over 5% Pd-Fe/ γ -alumina catalysts of various iron content. Addition of iron to a palladium catalyst decreases the quantities of chemisorbed hydrogen and carbon monoxide, and thus lowers the activity for CO hydrogenation. These effects are related to the formation of cationic states of the metals and heteronuclear clusters of Pd-Fe, which have low activity for adsorption and catalytic processes. Figures 3; references 15: 5 Russian, 10 Western.

12765/9835
CSO: 1841/562

UDC 541.124:541.183:546.21.027:546.98'46:542.46+621.039.8

STUDY OF OXYGEN INTERACTION WITH Pd/MgO CATALYSTS BY ISOTOPE EXCHANGE AND THERMODESORPTION

Moscow KINETIKA I KATALIZ in Russian Vol 27, No 2, Mar-Apr 86
(manuscript received 14 Jun 85) pp 411-417

[Article by R.I. Bakin, L.A. Kasatkina, G.A. Savelyeva, A.S. Sass and L.S. Siusheva, Moscow Chemical Technology Institute imeni D.I. Mendelyev; Institute of Organic Catalysis and Electrochemistry, KASSR Academy of Sciences, Alma-Ata]

[Abstract] Palladium on a carrier such as MgO occurs both as a highly dispersed metallic layer and in ionic form, so that a study of isotopic oxygen exchange also permits a study of the catalyst interaction with a single component of the oxidation reaction. In the present work a study was made of the interaction of oxygen with Pd/MgO catalyst using isotope exchange and thermodesorption techniques. A non-additive increase in activity was observed in oxygen isotope exchange reactions conducted over Pd on MgO. The carried Pd increases greatly the mobility of the oxygen carrier. It is postulated that low temperature homomolecular oxygen exchange over Pd/MgO passes through a stage of O_2^- anion radicals that are weakly bound to the surface, while the high temperature reaction occurs via oxygen adsorbed in the O_2^- form. Figures 3; references 10: 9 Russian, 1 Western.

12765/9835
CSO: 1841/562

UDC 541.128.3:539.215.3:546.02:546.76'73'72'711'655'21:542.941.7

PHYSICOCHEMICAL AND CATALYTIC PROPERTIES OF COBALT-CONTAINING SYSTEMS
Co-Me-O (Me = Cr, Fe, Mn, Ce)

Moscow KINETIKA I KATALIZ in Russian Vol 27, No 2, Mar-Apr 86
(manuscript received 20 Aug 84) pp 428-434

[Article by A.S. Ivanova, V.A. Dzisko, E.M. Moroz and S.P. Noskova, Institute of Catalysis, Siberian Department, USSR Academy of Sciences, Novosibirsk]

[Abstract] Cobaltites are known to be more active catalysts for deep oxidation of hydrocarbons than chromites or ferrites. It has also been reported that mixed spinels in which the cobalt/metal ratio is not equal to 2 are more stable than Co_3O_4 . A study was made of the effects of composition and temperature of heat treatment on Co-Me-O compositions where Me = the title metals on phase conversions, surface size, rate of hydrogen reduction and activity in reactions of deep oxidation of butane. The elemental nuclear

parameter of spinel structure observed in all systems increases both with increasing fraction of Me_nO_m and with temperature of heat treatment. The rate of Co-Me-O reduction is less than that of pure Co_3O_4 . The activity of specimens containing $\text{Me}_n\text{O}_m \leq 5$ mole % and calcined at 500°C is much higher than that of pure Co_3O_4 . Increasing both the fraction of Me_nO_m and the calcining temperature results in a drop in butane oxidation rate.

Figures 3; references 12: 11 Russian, 1 Western.

12765/9835
CSO: 1841/562

UDC 542.973:541.183.02:546.92:543.422

STRUCTURE AND PROPERTIES OF Pt AND Pd RANEY CATALYSTS

Moscow KINETIKA I KATALIZ in Russian Vol 27, No 2, Mar-Apr 86
(manuscript received 8 Apr 85) pp 451-455

[Article by A.B. Fasman, G.V. Antoshin, Ye.S. Shapiro, G.S. Musabekova and B.K. Almashev, Institute of Organic Chemistry imeni N.D. Zelinskii, USSR Academy of Sciences, Moscow; Institute of Organic Catalysis and Electrochemistry, KaSSR Academy of Sciences, Alma-Ata; Kazakh Pedagogic Institute imeni Abaya, Alma-Ata]

[Abstract] The structure and phase composition of Pt and Pd Raney catalysts prepared from Al and In alloys were determined using X-ray diffraction and photoelectron spectroscopic techniques. The data indicated that the surface of the alloys is enriched with non-noble elements (Al or In). The surface of the In-based alloys and catalysts has a metallic state while that of the Al-based alloys is oxidized. The surface composition of the catalysts depends on the preparation conditions, i.e., leaching from 20% KOH or oxidizing in 10% HNO_3 . The activities of the samples in respect to hydrogenation of potassium maleate and dimethylethenyl carbinol is a function of the nature of the non-noble component and the intermetallic composition and has no correlation with the Pt and Pd surface composition. Figure 1; references 8: 7 Russian, 1 Western.

12765/9835
CSO: 1841/562

UDC 542.943.7:543.42:546.75.14

POTENTIOMETRIC STUDY OF COMPOSITION OF COBALT-BROMIDE CATALYST USING COBALT ELECTRODE IN SOLUTIONS OF GLACIAL ACETIC ACID

Riga IZVESTIYA AKADEMII NAUK LATVIYSKOY SSR: SERIYA KHMICHESKAYA
in Russian No 2, Mar-Apr 86 (manuscript received 9 Sep 85) pp 243-244

[Article by S.R. Trusov, S.S. Chernaya and Ye.V. Fioshin, Riga Polytechnic Institute imeni A.Ya. Pelshe]

[Abstract] Cobalt-bromide and cobalt-manganese-bromide catalysts are used in the oxygen oxidation of alkylaromatic compounds, but both the catalysis mechanism and the catalyst composition are still under discussion and new research methods are needed. In the present article, results are presented on a newly developed cobalt electrode. A 10X4X2 mm strip of cobalt, immersed in 0.1 mole/l solution of oxalic acid in glacial acetic acid for 24 hours, became coated with poorly soluble cobalt (II) oxalate which prevented further access of hydrogen ions and dissolution of cobalt. This strip was used as an indicator electrode, reverse in respect to Co^{+2} ions in $\text{Co(OAc)}_2 \cdot \text{H}_2\text{O}$ solutions. Potentiometric curves, obtained with a chlorine/silver standard reference electrode, show that the cobalt electrode potential decreases with rising cobalt (II) concentrations and the slope of the linear portions of the curves increases with rising cobalt (II) concentrations. This method may be used to obtain additional information on the mechanism of the catalysis and the composition of the catalyst. Figure 1; references 2: 1 Russian, 1 Western.

12765/9835
CSO: 1841/565

CHEMICAL INDUSTRY

VERSATILITY--CREATION OF CHEMICAL PRODUCTION OPERATIONS WITH QUICKLY REORGANIZABLE PROCESSES

Moscow KHIMIYA I ZHIZN in Russian No 2, Feb 86 pp 30-35

[Article by Candidate of Technical Sciences M. Ye. Ostrovskiy and Candidate of Architecture S. V. Blinkov]

[Text] No one today needs to be convinced about the enormous significance of plants with versatile production processes to the national economy. Only production operations of this sort are capable of surmounting the technical paradox of our days--the sharp contradiction between the long time it takes for industrial assimilation of a new product or of a new production process and the dynamic nature of modern science, which is constantly producing new ideas in technology and materials, and production methods based on these ideas.

In chemistry and petrochemistry, the time of industrial realization of a technological innovation (from development to start-up of a facility at a newly built plant) is now averaging 8-10 years. But if a new plant is not built to support the new technology, and instead if the effort is limited to rebuilding an existing plant, the capital investments and assimilation time are of course lower, though still rather sizable.

The idea of versatile production, capable of switching in just a few months to a more progressive procedure or to other products, has been around a long time. It is a rather obvious idea. But in the 1950s and 1960s we devoted attention chiefly to "versatile" production buildings, to the layout of shops in which reconstruction could proceed in the shortest time possible. At that time our institute, the Central Scientific Research, Planning and Experimental Institute of Industrial Buildings and Structures, and other planning organizations developed flexible concepts for the master plans of chemical and petrochemical plants.* Enterprises in which different generations of production processes are exchanged quickly and painlessly were built and are now operating on the basis of these master plans.

But versatility of space no longer satisfies industry today. We need truly versatile production processes, so that research completed in the laboratory

*Read KHIMIYA I ZHIZN, No 11, 1970 and No 5, 1972 for information on this work--Editor.

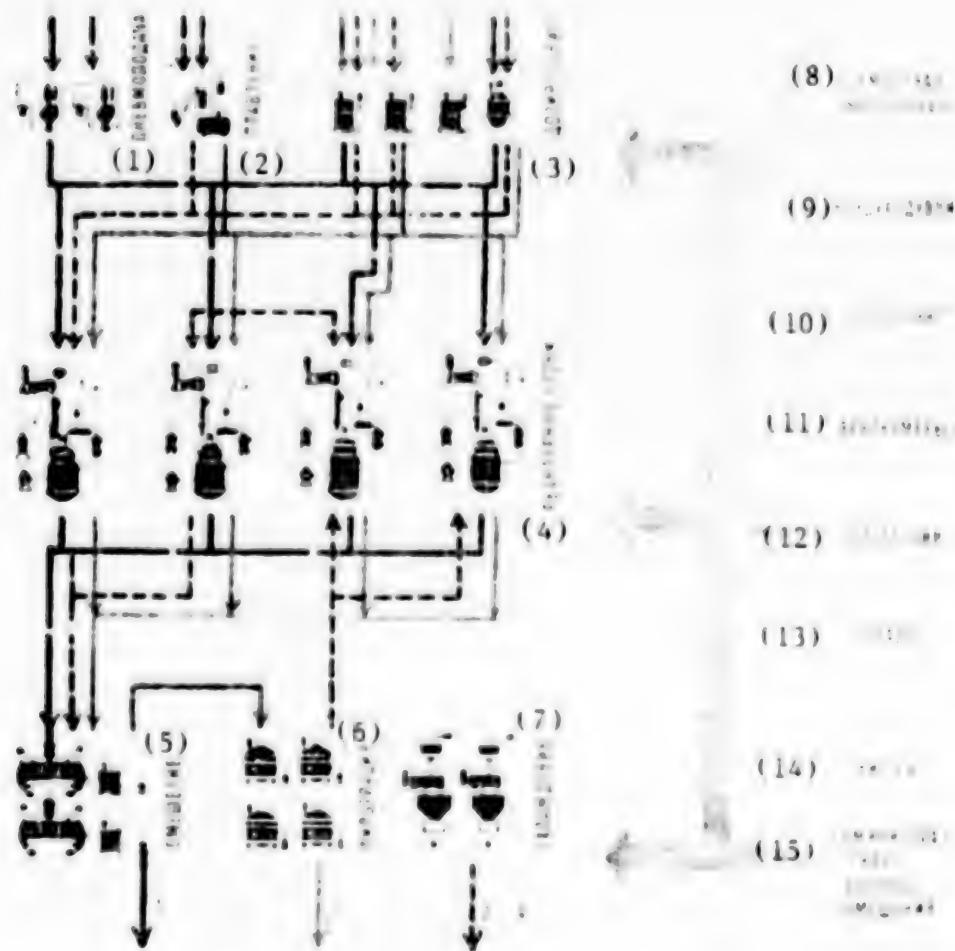
could be given over to production and so that production could begin within a few weeks without any kind of reconstruction of shops and sections. But are such production lines, such shops and plants realistic? There is one qualification we must make: There are no general-purpose production buildings, nor can there be any. Equipment for, as an example, a weaving factory and for a mineral fertilizer plant cannot be assembled in the same "box." Nor can there be (at least for the moment) versatile production operations capable of producing all kinds of chemical products. To think that this is possible is a dream.

On the other hand it would be reasonable and realistic to select in each sub-sector--on the basis of scientific forecasts of course--certain products, production processes and equipment which would change in the foreseeable future owing to scientific-technical progress. Predictions of this sort 10-15 years into the future are quite possible. They are especially important to low-volume chemistry producing various kinds of additives, plasticizers, some toxic chemicals, catalysts, ultrapure substances and so on. The need for changing products and altering production processes arises especially often in this area. Rather stable, typical stages of production processes carried out in standard units exist in most such production operations. And there are very few such types of units.

For example there are three main stages in the production of film-forming substances, of which there are dozens today: 1) preparation of the mixture, 2) synthesis of the polyester, 3) purification of the product. The main units used in the first stage are metering units and mixers, reactors are used in the second stage, and filters and refrigeration units are used in the third. By the way, the following stages are typical of not only production of film-forming but also most other low-volume chemical products: preparation of the raw material, synthesis of the product, and its isolation from the reaction mixture. Auxiliary and subsidiary divisions which require modernization more rarely are needed as well. These include divisions for preparing air and reagents, substations, thermal power plants, ventilation chambers, storehouses, repair shops, laboratories, divisions responsible for monitoring and measuring instruments and automatic systems, and finally, personnel support and administrative buildings.

Consider the diagram showing the arrangement of divisions and production units involved in the production of film-forming substances. A sensible arrangement makes it possible to successively produce not only the four products for which production flows are indicated by different lines and arrows, but also dozens of others similar to this tetrad. To switch from one product to another, it would be sufficient to wash out the production units and connecting lines, to replace the raw material, to change the sequence of connection of production units, and finally, to adjust the temperature and other parameters of the process a little.

This is what is known as a versatile production process.



A shop producing film-forming substances. Owing to sensible arrangement of the equipment, not only the four products for which the production flows are indicated by different lines and arrows but also dozens of other substances similar to them can be produced successively. 1--production of 10-47 polyester; 2--production of E-40 ester; 3--production of FSin-34 polyester; 4--production of 101 resin

Key:

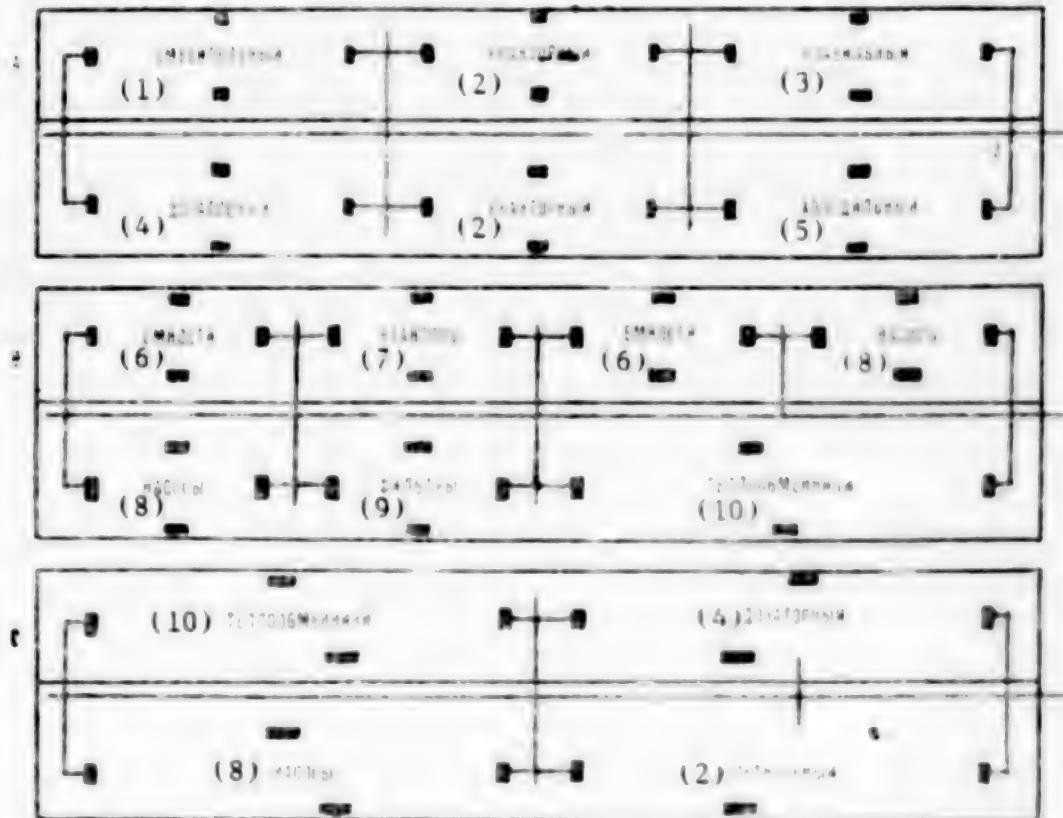
- | | |
|-------------------|--|
| 1. Pneumatic feed | 9. Air ducts |
| 2. Melting | 10. Thermal power plant |
| 3. Metering | 11. Ventilation chambers |
| 4. Reactor blocks | 12. Substations |
| 5. Mixing | 13. Storehouses |
| 6. Filtration | 14. Monitoring and measuring instruments and automatic systems |
| 7. Cooling | 15. Administrative and personal services facilities |
| 8. Repair shop | |

When equipment is arranged into distinct zones with regard for its possible movement whenever a production process must be reorganized, there is practically never a need for reserve output capacity. Only the shop's connecting lines need to be laid with an extremely insignificant reserve, with some redundancy. But these small additional outlays produce a large impact: Obsolescence of equipment is retarded abruptly, since with minor alterations it can work for decades.

The layout of apparatus is also found to be rather flexible in shops with versatile production processes. The equipment can be positioned in functional blocks--so-called outfits. Each outfit represents a certain production process: polymerization or hydrogenation, rectification or extraction. This layout method could not be better suited to production operations having stable, unchanging production stages--for example operations producing film formers. But if transition to a new production process requires considerable redesign of the processes, it is more convenient to locate the equipment in specialized groups: In this case all heat exchangers are grouped together, and all reactors are located side by side. Finally, a mixed layout is possible as well: The units most important to the production operation (reactors for example) can be located in blocks of outfits, while all other equipment (pumps, heat exchangers, containers) may be located as the specific needs require. The principle followed in laying connecting lines also depends on the method selected for laying out production units in the shop. If the equipment is installed in blocks, it would be more preferable to lay centralized pipelines in a corridor between production units. Then the pipe network would be the most compact. When it is impossible to break each stage of the process down into a compact block, additional feeder lines must be laid from the mains. Such routing of pipelines (main and dead-end) is of course less economical, but it does provide for greater flexibility. And finally, the most flexible system of connecting lines would be a ring system encompassing all of the production units. It is universal, and it permits rapid maneuver of the flows of raw materials, heat and cooling water--all that is required for production. Flexibility is greater, but the number of reserve connecting lines is greater as well.

A very interesting concept was proposed for versatile production operations by the State Institute for the Planning of Enterprises Producing Organic Intermediates, Dyestuffs and Reagents. The main pipelines lead to a special connecting panel to which pipelines are attached as necessary from blocks and groups of specialized production units. This system recalls an electrical junction: Just insert the right plug into the right socket, and the instrument begins working at the needed moment. In other words to reorganize the production process, it would be sufficient to switch the necessary connecting lines on the connecting panel.

Now that designers go far beyond general layouts and master plans when they plan entire shops and plants, sensible space planning concepts for buildings are still important of course. Moreover building design is acquiring even greater significance.



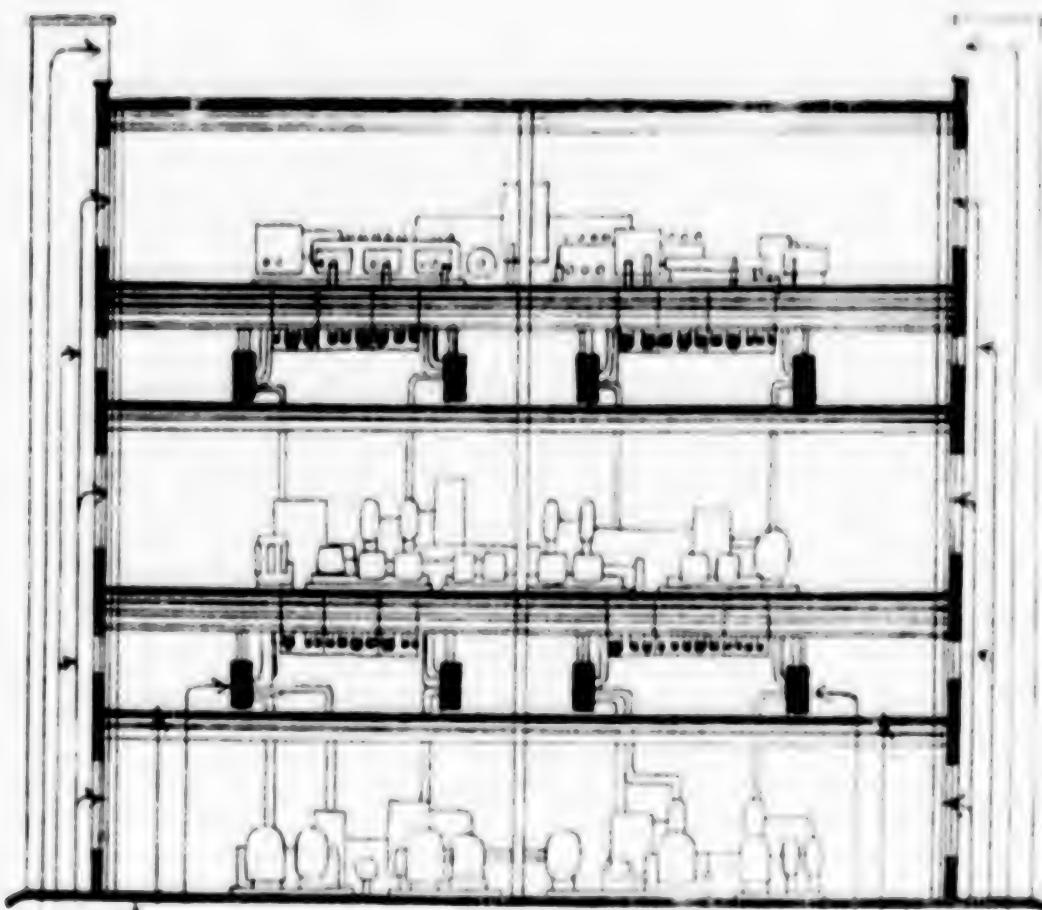
Equipment layout and methods of laying connecting lines of a production operation using versatile processes: A--functional blocks; B--specialized groups; C--mixed groups; 1--circular layout; 2--centralized layout; 3--dead-end layout

Key:

- | | |
|------------------|---------------------|
| 1. Mixing | 6. Containers |
| 2. Reactor | 7. Reactors |
| 3. Melting | 8. Pumps |
| 4. Metering | 9. Filters |
| 5. Refrigerating | 10. Heat exchangers |

Here as well there are many subtleties when we consider the general principles of designing buildings for versatile production operations. It is entirely obvious that there must be sufficient room for maneuvering both production units and connecting lines in such buildings. This means that there must be the fewest inside walls and partitions, maximum distances must be foreseen between columns, and there must be universal supports for the production equipment, possibly with a certain strength reserve.

Even in the case of maximum versatility of the production process, when it is reorganized something must be taken away from the shop, something must be put there to replace it, and something must be installed at special repair sites outside the buildings. This is why real versatility of a production



- (1) Service floors
- (2) Production floors
- (3) Walkways
- (4) Installation lanes
- (5) Vertical communication shafts
- (6) Connecting panels

One of the variants of a multistory building adapted to a versatile production process. Connecting panels are located on the service floors. Pipelines leading from blocks and groups of specialized production units are connected to these panels as necessary.

Key:

- | | |
|-----------------------|----------------------------------|
| 1. Connecting panels | 4. Production floors |
| 2. Walkways | 5. Service floors |
| 3. Installation lanes | 6. Vertical communication shafts |

operation would be unimaginable without dependable and convenient shop transportation, taking the form of cranes, both floor models and suspended. Moreover the connecting lines must not hinder the work of hoisting and transporting equipment. Lines should be laid in centralized mains on service

floors, in the space between girders. Were we to follow these principles without deviation when drawing our plans, and if we avoid designing and building in the old way, a real possibility arises for creating versatile plants intended to produce a wider product assortment than, for example, an assortment of film-forming or specific-purpose additives. The ideas of versatile production arrived at in low-volume chemistry could be extended to medium- and high-volume production. Then new problems would appear. Machinery and apparatus capable of working while significant changes are being made in production processes would be required. It would be sufficient to point out that reactors would have to be planned with regard for changes in the corrosive medium, pressure, temperature and other operating conditions.

Now a few words about economics. There is the apprehension that any versatile production process costs a great deal, that it is more expensive than traditional, unflexible processes. This apprehension is based on the notion that a large pool of reserve equipment that remains mothballed for years on end is required for production operations that undergo reorganization as necessary, and that as a result, the effectiveness of capital investments is negligible. This would be unavoidable, of course, if different production lines producing different products were located beneath the same roof and used in succession. But this is not what versatility means at all.

Creation of reserve output capacities at plants for production of a new article is a special problem. This approach is considered in exceptional cases. There will of course be a need for stockpiling certain reserves--in energy, heat supply and water supply--in enterprises utilizing versatile production processes. But these reserves are not large, and the additional expenses are more than compensated by the enterprise's versatility--by maximum utilization of equipment, by the speed with which new equipment, processes and new products are assimilated, and by the swiftness of each reorganization. Recall that famous statement by Dzh. Bernal: "The industrial structure of society of the future will be such that no definite methods for producing and manufacturing articles will be used; instead, the process of production will be viewed as a constantly growing and changing process guided by scientific research" ("Mir bez voyny" [World Without War]).

Plants with versatile production processes closely associated with research institutes and forming scientific-production associations with them can serve as a model of such a structure. The road from scientific development to industrial production is shortened by many orders of magnitude in such associations. And this is not a theoretical hypothesis. Large-scale research can be conducted and commercial products can be produced with the same equipment in low-volume chemistry right now. Such is the case for example in the Institute of Fine Organic Chemistry of the Armenian SSR Academy of Sciences and its experimental production operation.*

The future belongs to chemical enterprises with versatile production processes. Their creation poses new problems in the planning of production

*This is discussed in KHIMIYA I ZHIZN, No 8, No 9, 1981--Editor.

processes, machine building, architecture and construction, ones which must be solved without delay. The time has come to think about an integrated scientific program for developing the assortment of products, production processes, universal equipment, instruments and control systems necessary for solution of this problem, so important to the national economy.

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CSO: 8144/1483

COMBUSTION

UDC 614.841.12:662.611/.612+541.124-13:547.211:541.515

INTERRELATION OF NORMAL COMBUSTION RATE OF METHANE IN AIR AND NON-EQUILIBRIUM CONCENTRATION OF HYDROGEN ATOMS IN FLAME FRONT

Moscow KINETIKA I KATALIZ in Russian Vol 27, No 2, Mar-Apr 86
(manuscript received 1 Aug 84) pp 270-274

[Article by Yu.N. Shebeko and A.Ya. Korolchenko, All-Union Scientific-Research Institute of Fire Protection, Balashikha]

[Abstract] Flame propagation in vapor-gas mixtures is currently viewed from either a thermal or diffusion type theory. Organic substances burning in air are customarily approached with the thermal theory, although much research has pointed out the important role of diffusion of active sites, especially hydrogen, in the propagation of such flames in a fresh mixture. A correlation is expected to exist between the normal combustion velocity and the non-equilibrium hydrogen atom concentration in a flame front. In the present work an attempt was made to find such a correlation for a methane-air flame, typical for the combustion of organic substances in air. Theoretical study of the kinetics of chemical processes in the high temperature region of the flame front did produce such a correlation, but it does not coincide with the relationship derived from the thermal theory of flame propagation. The reaction of the HO₂ radical in the high temperature zone (1800 K) is shown to play an important role. The results agree with the concept of atomic hydrogen diffusion in a fresh gas mixture during flame propagation. Figures 4; references 20: 6 Russian, 14 Western.

12765/9835
CSO: 1841/562

UDC 541.124-13:[124.7+126.2].541:546.132'17+621.43.019.2

RULES GOVERNING BRANCHED CHAIN DECAY OF NITROGEN TRICHLORIDE NEAR SECOND LIMIT OF AUTOIGNITION

Moscow KINETIKA I KATALIZ in Russian Vol 27, No 2, Mar-Apr 86
(manuscript received 28 Sep 83; after revisions, 3 Apr 85) pp 275-281

[Article by Ye.A. Markevich, Institute of Chemical Physics, USSR Academy of Sciences, Moscow]

[Abstract] The previously observed existence of a second limit of autoignition of nitrogen trichloride confirmed the possibility of the reaction proceeding via a branched chain mechanism. However, the proposed mechanism fails to explain some of the kinetics of NCl_3 decay, such as the relatively prolonged induction period in the autoignition region terminating in a sharp and rapid flash. It was then proposed that the process includes the formation of a stable intermediate compound during the induction period which participates in the branching process. In the present work, a study of the rules governing the autoignition of NCl_3 near the second limit confirms the mechanism of NCl_3 decay in which a secondary, relatively stable compound is formed. A reaction of homogeneous rupture was also identified which controls the nature of the second limit. Figures 3; references 15: 10 Russian, 5 Western.

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CSO: 1841/562

UDC 662.611/.612:614.841.12+541.126.011.4:546.21'11

EFFECT OF ACTIVE SITES, CREATED FROM EXTERNAL SOURCE, ON INDUCTION PERIOD OF AUTOIGNITION OF HYDROGEN-OXYGEN MIXTURE

Moscow KINETIKA I KATALIZ in Russian Vol 27, No 2, Mar-Apr 86
(manuscript received 6 Mar 85) pp 482-485

[Article by A.N. Baratov, Yu.N. Shebeko and A.Ya. Korolchenko, All-Union Scientific-Research Institute of Fire Protection, Balashikha]

[Abstract] One of the most important characteristics in the autoignition of gas mixtures is the induction period, and while artificial chain generation has been experimentally demonstrated to have a significant effect on the magnitude of the induction period, this has never been determined quantitatively. In the present work, a 19-step kinetic model of a stoichiometric mixture of hydrogen and oxygen was used to study the effects of active site generation on the induction period at 860-1100 K. Analysis of initial non-zero hydrogen atom concentration and constant rate

of li-atom generation shows that artificial chain generation results in a relatively low induction period at temperatures greater than 930 K. At lower temperatures, the change in induction period is significant as evidenced in a lower time period to accrue a critical concentration of hydrogen peroxide. Figures 2; references 7 (Russian).

12765/9835
CSO: 1841/562

ELECTROCHEMISTRY

UDC 620.197.3

STUDY OF CORROSION INHIBITORS FOR METALS IN NEUTRAL MEDIA--PART IV. ELECTRON MICROSCOPIC PICTURE OF STEEL SURFACE DURING POLARIZATION STUDIES

Riga IZVESTIYA AKADEMII NAUK LATVIYSKOY SSR: SERIYA KHMICHESKAYA
in Russian No 2, Mar-Apr 86 (manuscript received 12 Dec 85) pp 186-189

[Article by V.M. Kadek, S.A. Klyavinya, Kh.B. Krast, Z.G. Rubess, and L.K. L
L.K. Lepin (deceased), Institute of Inorganic Chemistry, LaSSR Academy of
Sciences]

[Abstract] An electron microscopic study was made of the surfaces of samples of 08PS steel (C - 0.05-0.11%; Mn - 0.35-0.65%; Si - 0.05-0.17%; Cr - 0.11%; balance Fe) both after electrostatic reduction of oxide films, and at various points along a potentiodynamic polarization curve. The background solution was Riga tap water containing mg/l: Ca^{+2} - 58.1; Mg^{+2} - 15.8; HCO_3^- - 225.7; Cl^- - 54; SO_4^{-2} - 33.7; total hardness, mg-eq - 4.20; dry residue 340.5. If sodium borogluconate inhibitor is present, the anode potentiodynamic curve has two maxima of current density. Electron microscopy of the steel surfaces at various points along the polarization curve reveals the presence of passivation and activation processes. Cathode reduction of steel oxides in tap water results in calcium carbonate formation if aragonite softener is present. Figures 4; references 5:
2 Russian, 3 Western.

12765/9835
CSO: 1841/565

UDC 620.197.3

STUDY OF CORROSION INHIBITORS FOR METALS IN NEUTRAL MEDIA--Part V.
DEVELOPMENT AND STUDY OF PHOSPHORUS AND BORON-BASED CORROSION INHIBITORS FOR
USE IN NEUTRAL AQUEOUS MEDIA

Riga IZVESTIYA AKADEMII NAUK LATVIYSKOY SSR: SERIYA KHMICHESKAYA in Russian
No 2, Mar-Apr 86 (manuscript received 6 Jan 86) pp 190-200

[V. Kadek, S. Köhler, Z. Rubess, H.-J. Bilz, H. Baumanis, H. Krast,
B. Berge and D. Vitola, Institute of Inorganic Chemistry LaSSR Academy of
Sciences; Institute of Power, Leipzig, GDR]

[Abstract] The increasingly critical world-wide availability of potable water has necessitated both the use of high salt content water (up to sea water) and multiple recirculation for industrial cooling purposes. In both cases the corrosiveness of the water is increased and more effective means for protecting equipment are required. In accordance with a bi-lateral agreement between the Institute of Inorganic Chemistry LaSSR and the Institute of Power, GDR, methodology and comparative tests were developed for phosphorus and boron-containing corrosion inhibitors for steel in neutral media. Test requirements such as temperature, duration of exposure, rate of circulation and liquid composition were formulated. Comparative tests showed that boron and phosphorus inhibitors are about equally effective under recirculation conditions, while under static conditions boron gluconate is more effective. At full protection concentrations, a 5 to 10-fold lowering of the passification concentration markedly reduces the effectiveness of boron gluconate. A composition containing both boron gluconate and orthophosphates is synergistic and permits lowering the boron gluconate concentration. Phosphonate inhibitor FC 6/84 is highly effective and protects steel over a wide range of cooling water compositions. Figures 4; references 11: 2 Russian, 9 Western.

12765/9835
CSO: 1841/565

UDC 547.458.81:542.64

FEATURES OF SYSTEM CELLOPHANE-LIQUID MEMBRANE IN ELECTROCHEMICAL EXTRACTION PROCESSES

Riga IZVESTIYA AKADEMII NAUK LATVIYSKOY SSR: SERIYA KHMICHESKAYA in Russian No 2, Mar-Apr 86 (manuscript received 21 Oct 85) pp 214-216

[Article by I.D. Kulikova and V.P. Ose, Institute of Inorganic Chemistry LaSSR Academy of Sciences; Institute of Microbiology imeni A. Kirkhenshteyn, LaSSR Academy of Sciences]

[Abstract] Cellophane film (GOST 7730-74) is used to separate the organic solvent phase from aqueous solutions during studies of the electrochemical

extraction of palladium (II) with liquid membranes. The electrical resistance of the cellophane barriers both in the electrolyte and at the membrane-aqueous solution interface is low compared to that of the organic phase, so that the cellophane may be considered as an extension of the aqueous phase. However, if the cellophane is located at the interface, the transfer process is observed to slow down. In the present work an electron microscopic study of pre distribution in the cellophane showed that most of the capillaries are branched and not perpendicular to the film surface. Therefore, if the cellophane is located at the interface during electrochemical extraction and re-extraction of palladium (II) with liquid membranes, the formation of precipitates will lower the speed of the process. Figures 2; references 7 (Russian).

12765/9835
CSO: 1841/565

FERTILIZERS

REORGANIZATION OF FERTILIZER INDUSTRY

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 25 May 86 p 2

[Article by A. Kochetkov, first deputy minister of chemical fertilizer production: "The 'Quality' Program"]

[Text] In a recent quality-control inspection, the Chemical Fertilizer Ministry examined all of the economic sanctions brought forward against the ministry's plants since the start of the year and it found a record level of poor production. More than 6 million rubles had been paid for production of poor-quality production. This seems all the sadder when one considers the fact that the employees of this ministry succeeded in exceeding their production quotas in almost all aspects.

Therefore, it has obviously become necessary to concentrate ministry efforts on increasing production quality. As was stated at the meeting, the solution of this problem is not only an economic question but a political one as well. Production quality is an indicator of how well workers are doing their jobs which in turn is determined by how modern the production process is, the quality of the equipment and how well work and management are organized. These factors are what make a given plant what it is. For years, the workers of the Apatit Production Association in Murmansk Oblast, Azot in Grodno, Minudobreniya in Voskresensk and Fosforit in Kingisepp have worked to keep the high esteem felt for their products. What guarantees the quality of their products is constant work to renew production and close ties with scientific organizations.

There are many such plants within the ministry. However, today's needs are such that it is impossible for backward plants to hide behind the achievements of the leading establishments. If the state seal of quality is given to more than half of the production of 23 plants and the total of the industry's production receiving that seal amounts to 42 percent, then by the end of this five-year period, we will be obliged to turn out twice as much certified production. Every worker collective, especially those in the lagging plants, must strongly reorganize their work and can no longer count on others to take up the slack.

There do exist plants at which it has become the custom to turn out faulty products. This is true, for example, of the Fergana Azot Production

Association which has received half of all economic sanctions this year or the Azot Production Association in Rustavi which over the last 5-year period paid more fines than all others in Soyuzazot. To stabilize the work of these and other associations, they have received greater financial support. In addition, they are receiving assistance and know-how from other plants that are helping them to adjust their equipment to its proper parameters. Experienced and knowledgeable specialists have been given the job of directing these plants. There now exist all of the right possibilities for thoroughly reorganizing their work.

In the 12th five-year period, nearly half of all investments are going into reconstruction. This has made it possible to accelerate work on renewing production processes whose obsolete equipment and technology has tended to be the cause of low-quality production. Reconstruction helps to provide our nation's economy with new and promising types of fertilizers and especially KAS (solutions of ammonium nitrate and carbamide) and trace-element fertilizers and to satisfy agriculture's demand for liquid complex fertilizers.

However, along with the introduction of new and more efficient production processes, it is also necessary to increase the quality of traditional fertilizers whose physical and mechanical properties have been the subject of frequent complaints. For example, the widely-used ammonium nitrate, carbamide and nitrogen-potassium-phosphorus fertilizers have such critical defects as caking tendencies, irregular granular composition and instability but scientific research institutes have found ways of eliminating these faults.

The directors of the industry have developed a "quality" program for 1986-1990 which provides a comprehensive solution to the problem. This is an important step toward scientific planning of high-quality production and is based on thorough analysis of the quality level of all mineral fertilizers. The analysis is carried out by every plant in accordance with the needs of its clients. A plan is then established and considers what is necessary to modernize technology, what sort of equipment is required and how shops are to be reconstructed with regard to cost and time. In essence, this is a quality program for every process and has become a basis for planning throughout the ministry. These measures are also strengthened by changes in finance procedure. At this time, in branch plans for capital construction work, the measures aimed at improving production quality are the ones that receive a priority on funding.

In reconstruction and technically re-equipping themselves, plants have the right to reject plans that cannot assure their production of the state seal of quality. This should also make itself felt in increased responsibility on the part of scientists, builders and designers. Omissions and errors in designs by organizations such as GIAP [State Scientific Research and Design Institute of Nitrogen Industry and Organic Synthesis Products] (I. Kisil', director) have turned out to be one of the causes of the low product quality in the Rustavi Azot Association and other such plants. This forms a unique chain in which the poor work of some plants excuses other plants of any responsibility for quality. To break such a chain, it is not enough to eliminate mistakes from designs but to extensively educate the workers.

Such a chain of errors is made up of many links. The users of washing powders produced by the Vinnitsa and Pervomaysk Khimprom Associations and the Chimkent Fosfor Association complain of their low quality. The defective powders were produced using low-quality sulfanol from the Sumgait Khimprom Association (Ministry of Chemical Industries). This association was in turn provided poor materials from the Ministry of Petroleum Chemistry.

Interdepartmental control should become a means of preventing defective production. At most of the chemical industry's plants producing mineral fertilizers, such control is carried out according to old traditions and representatives of the Ministry of Agricultural Industries [Gosagroprom]. Gosstandart control is soon to be introduced at 15 plants. The quality program also stipulates the creation of quality-analysis groups comprised of specialists from scientific research institutes whose task will be to regularly check how well standards and technical specifications are being followed.

Greater importance has been gained by control and measurement technology. The Bor Production Association has begun work to realize an excellent idea: full automation of the analytical control process. This makes it possible to exclude laborious work by the technological control department and guarantee precise measurement. Unfortunately, at this time, this is only feasible at the Bor Association which is so excellently equipped with modern equipment. The broad introduction of control automation is hindered by the lack of equipment and its imperfections. In our powerful industry in which hundreds of tons of production are turned out in an hour's time, an enormous quantity of defective products can be caused by imprecise equipment and the inability to quickly determine the composition of the raw material or the quality of the final product. Thus, for example, there is a case in which 17,000 tons of substandard nitroammophoska was produced by the Meleuz Chemical Plant. One of the main causes was its poor quality-control and measurement equipment. It was only fair that the plant paid a large fine which shook it into more quickly re-equipping itself. However, the task of renewing production is one faced today by many plants. Without the help of the builders of their machinery and equipment, these plants will be unable to modernize.

We have great plans for a growth in automation. For example, two plants, the Nevinomyssk Azot Production Association and the Cherepovets Ammofos Production Association, are preparing to create integral control systems which will control all levels of plant activity from the receiving of raw materials to the making of the finished product. These two plants are the prototype of the entire mineral fertilizer industry and the wide use of integral control systems has already been planned for coming five-year period. However, one should not think that scientific and technical progress will make it possible to make it easy to turn out excellent products. Equipment is just what it is and it is man that must control it. For example, the cause of a 450,000-ruble mistake at the Korund Production Association was the "initiative" of the shop foreman Y. Grishin who violated technical specifications by changing the formula for the production of detergents. The Kuybyshev-Fosfor Production Association has already many times paid reclamations for detergents so poorly-packed that they could not withstand the

stresses of railroad shipment. However, the director, G. Kutepov, instead of concentrating the attention of the administration and technical services on this problem, continued to blame everything on circumstances. The only conclusion that can be drawn here is that the first step will have to be an adjustment of some peoples' attitudes toward their work.

The fertilizer industry produces tens of billions of rubles worth of products. Economic sanctions equaling a sum of 6 million rubles may therefore not seem to be so great but we must learn to feel that we cannot afford to lose even a kopek to faulty production.

In the shops, production sections and among the crews of plants and organizations of the Chemical Fertilizer Ministry, there is renewed competition to improve product quality and a struggle to achieve the new honorary title "exemplary quality". Our industry has its own examples for comparison. These include N. Chepulskiy's crew at the Sumi Khimprom Production Association, the Komsomol shift of S. Vedernikov at the Severodonetsk Azot Association, G. Cheremukhina, an official of the Voskresensk Minudobreniya Production Association, A. Yakovenko of the Estonofosforit Production Association and others. A matter of honor for every group of workers is to bring their assigned plans to life.

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UDC 541.123.3+547.495.9

POLYTHERM OF TRIPLE SYSTEM GUANADINE NITRATE - AMMONIUM NITRATE - WATER

Tashkent UZBEKSKIY KHMICHESKIY ZHURNAL in Russian No 1, Jan-Feb 86
(manuscript received 13 Jun 85) pp 69-71

[Article by Ye.V. Obutkova, D.Kh. Yunusov and V.A. Kim Lin Zu, Institute of Chemistry, UzSSR Academy of Sciences]

[Abstract] Guanadine compounds can be used to produce low cost mineral fertilizers, and ammonium nitrate is a widely used, concentrated, ballast-free fertilizer. While the isothermal solubility of the guanadine nitrate - ammonium nitrate - water system at 25°C has been studied previously, the data are inadequate for production purposes, because ammonium nitrate, after synthesis, must be sequentially evaporated and ground under polythermal conditions as high as the melting point temperature of ammonium nitrate. In the present work a polytherm of the above system at -1.3°C to 125.0°C is presented. To determine the curvature of the crystallization areas and to define the composition of the eutectic point of the system, isotherms were laid out at 20° intervals and a projection of the system on the ammonium nitrate - water side was constructed. Figures 2; references 7: 6 Russian, 1 Western.

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FREE RADICALS

UDC 541.138.2+541.515

ELECTROCHEMICAL OXIDATION OF NITROXYL RADICALS

Leningrad ZHURNAL OBSHCHEY KHMII in Russian Vol 56, No 4, Apr 86
(manuscript received 2 Aug 84) pp 855-860

[Article by G.I. Shchukin, V.A. Ryabinin, I.A. Grigoryev and L.B. Volodarskiy,
Novosibirsk Institute of Organic Chemistry, Siberian Department, USSR
Academy of Sciences]

[Abstract] Cyclic voltamperometry with a platinum electrode, in acetonitrile as solvent, was used to study the effects of various structural factors on half-wave potential of the electrochemical oxidation of the nitroxyl group in 10 of the more common types of stable nitroxyl radicals, imino- and nitronylnitroxyl radicals. The half-wave potential increases as the electron acceptor nature of the substituent on the radical becomes more negative. This effect is described by the Hammet equation for nitroxyl groups of the piperidine series. The nitroxyl group in nitroxyl radical of 3-imidoazolene-3-oxide is most stable towards electrochemical oxidation among the cyclic di-tert-alkyl nitroxyl radicals. References 16: 9 Russian, 7 Western.

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ORGANOMETALLIC COMPOUNDS

UDC 547.244

STUDY OF REACTIONS OF COMPLEX FORMATION OF BORONORGANIC COMPOUNDS. DIPOLE MOMENTS OF TRIARYLBORANE COMPLEXES WITH METHYLAMINE AND DIMETHYLAMINE

Leningrad ZHURNAL OБSHCHEY KHIМII in Russian Vol 56, No 4, Apr 86
(manuscript received 4 May 85) pp 928-931

[Article by G.A. Yuzhakova, M.N. Rybakova, M.I. Belonovich, O.A. Klyuykova and I.I. Lapkin]

[Abstract] The dipole moment is an important characteristic of a molecular complex since its magnitude is directly related to the degree of charge transfer from an electron donor to an acceptor. In the present work, methylamine and dimethylamine complexes of 14 triarylboraпes were synthesized and the dipole moments of the donor-acceptor bond determined. The magnitude of the dipole moment is a function of the nature of the amine and the substituent in the aromatic ring of the triarylboraпe. Tables 3; references 11: 8 Russian, 3 Western.

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ORGANOPHOSPHORUS COMPOUNDS

UDC 547.26'118

TAUTOMERIC CONVERSIONS OF PHOSPHORYLATED DERIVATIVES OF 1,3,5-TRIAZINE,
HEXAHYDRO-1,3,5-TRIAZINE-2,4,6-TRIONE

Leningrad ZHURNAL OБSHCHEY KHMII in Russian Vol 56, No 4, Apr 86
(manuscript received 3 May 85) pp 756-763

[Article by M.G. Zimin, Ye.V. Fomakhin, A.N. Pudovik, L.V. Zheleznova and
E.I. Goldfarb, Kazan State University imeni V.I. Ulyanov-Lenin]

[Abstract] A study of the effects of the phosphoryl group on the tautomerism of phosphorus derivatives of 1,3,5-triazine shows that 2,4,6-trichloro- and 2-methoxy-4,6-dichloro-1,3,5-triazines react with trialkylphosphites to form 2-dialkoxyphosphonyl-4,6-dichloro- and 2-methoxy-4-dialkoxyphosphonyl-6-chloro-1,3,5-triazines. These products react with salts of thiophosphoric acid to form derivatives of the respective 1,3,5-triazines which are capable of 1,3 S_N tautomerism. Introduction of a dialkoxyphosphonyl group to the triazine ring causes the equilibrium to shift in the direction of isomers having admiophosphates at the phosphorus atom. A new type of tautomerism of phosphoryl derivatives of hexahydro-1,3,5-triazine-2,4,6-trione, characterized by 1,3 O_N shift of the phosphoryl group, has been detected. Figure 1; references 5: 3 Russian, 2 Western.

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UDC 547.341:547.314

REACTIONS OF ACETYLENES WITH HYPOPHOSPHOROUS AND PHOSPHONOUS ACIDS

Leningrad ZHURNAL OБSHCHEY KHMII in Russian Vol 56, No 4, Apr 86
(manuscript received 23 Apr 85) pp 773-781

[Article by E.Ye. Nifantyev, L.A. Solovetskaya, V.I. Maslennikova,
R.K. Magdeyeva and N.M. Sergeyev, Moscow State Pedagogic Institute
imeni V.I. Lenin]

[Abstract] Homolytic hydrophosphorylation of acetylenes with acids of trivalent phosphorus was studied for the first time. It was shown that hydrophosphorylation of 1-alkynes depends on the type of reagent used. Homolytic hydrophosphorylation of acetylene with hypophosphorus acid takes place chiefly with one molecule of the acid, while addition of phosphonous acids to acetylenic hydrocarbons results in both mono- and diphosphorylated adducts. The nature of the initial phosphonic acid also has a great effect on the formation of alkylenediphosphonic acids. Study of the stereochemical direction of the reaction shows that monoaddition of hypophosphorous and phosphonic acids to acetylenes always results in a mixture of cis- and trans-isomers. Figure 1; references 6: 5 Russian, 1 Western.

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UDC 547.241+547.26'118

SYNTHESIS OF VINYL ESTERS OF PHOSPHOROUS ACID

Leningrad ZHURNAL OБSHCHEY KHMII in Russian Vol 56, No 4, Apr 86
(manuscript received 17 Jun 85) pp 781-786

[Article by M.M. Kabachnik, Z.S. Novikova, Ye.G. Neganova and I.F. Lutsenko,
Moscow State University]

[Abstract] It was shown previously that it is possible to use acid iodides of triple-coordinated phosphorus as phosphorylating agents in reactions with carbonyl compounds to prepare vinyl esters of phosphorous acids. In the present work 15 vinyl esters were prepared by reaction of phosphorous and phosphonous acid moniodides with various aldehydes and ketones in the presence of tertiary amines such as triethylamine, pyridine and diethyl aniline. References 11 (Russian).

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UDC 547.1'118:547.484.34

REACTION OF HEXACHLOROCYCLOTIPHOSPHAZENE WITH ACETOACETIC ESTER

Leningrad ZHURNAL OБSHCHEY KHMII in Russian Vol 56, No 4, Apr 86
(manuscript received 5 May 84) pp 786-788

[Article by M.G. Yaklakov, V.I. Astrina and V.V. Kireyev, Moscow
Chemical Technologic Institute imeni D.I. Mendeleyev]

[Abstract] A study was made of the reaction of hexachlorocyclotiphosphazene with acetoacetic ester in the presence of triethylamine to determine whether substitution at the phosphazene phosphorus atom takes place at the C- or O- reaction site of the ambident ion. The results indicate that the reaction proceeds via O-substitution to form products having phosphate structure. References 5: 2 Russian, 3 Western.

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UDC 547.26'118

REACTIONS OF MORPHOLINESULFOLENE CHLORIDES WITH TRIALKYLPHOSPHITES

Leningrad ZHURNAL OБSHCHEY KHMII in Russian Vol 56, No 4, Apr 86
(manuscript received 16 Oct 84) pp 788-790

[Article by F.N. Mazitova and V.K. Khayrullin, Institute of Organic and
Physical Chemistry imeni A.Ye. Arbuzov, Kazan Branch USSR Academy of
Sciences]

[Abstract] A study of the reaction of 4-morpholinesulfenyl chloride with triethyl and tributylphosphites for the purpose of preparing O,O'-dialkyl-S-morpholine-thiophosphates having practical value showed that the reaction results in the formation of labile dialkyl-S-morpholinethiophosphates which eliminate active sulfur both during the reaction and while standing to form morpholides of dialkylphosphoric acid and traces of trialkylthiophosphates. References 4: 1 Russian, 3 Western.

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REACTIONS OF 2-CHLOROALKANIMINES WITH TRIALKYLPHOSPHITES AND TRIPHENYLPHOSPHINES

Leningrad ZHURNAL OБSHCHEY KHMII in Russian Vol 56, No 4, Apr 86
(manuscript received 21 Jan 85) pp 805-809

[Article by A.D. Sinitsa, V.S. Krishtal, V.V. Momot, N.K. Maydanovich and V.I. Kalchenko, Institute of Organic Chemistry, UkrSSR Academy of Sciences, Kiev]

[Abstract] Data on the reaction of nucleophilic compounds of trivalent phosphorus with imines having a halogen atom in the alpha-position to the azomethine group are scarce, and a study was made of the reactivity of trialkylphosphites and triphenylphosphine with alkane imines having a chlorine atom and other substituents of various electronic nature at the alpha-position. The reactivity of 2-chloroalkane imines is determined by the electronic nature of the substituent at the azomethine group. Donor substituents result in formation of C-phosphorylated products, while electron acceptor substituents increase reactivity in respect to nucleophilic derivatives of trivalent phosphorus and result in products having a nitrogen-phosphorus bond. Table 1; references 8: 6 Russian, 2 Western.

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REACTIONS OF N,N-BIS(CHLOROMETHYL)AMIDES OF CARBOXYLIC ACIDS WITH SALTS OF DI- AND TRITHIOPHORIC ACIDS. 1,3,5,2-DITHIAAZAPHORPHORINANES

Leningrad ZHURNAL OБSHCHEY KHMII in Russian Vol 56, No 4, Apr 86
(manuscript received 15 Aug 85) pp 809-813

[Article by A.F. Prokofyeva, S.A. Manayev, T.V. Aleshnikova, V.V. Negrebetskiy, A.F. Grapov and N.N. Melnikov, All-Union Scientific-Research Institute of Chemical Means of Plant Protection, Moscow]

[Abstract] The chemical properties of N,N-bis(chloromethyl)amides of carboxylic acids are not well known, and a study was made of the reactions of these compounds with salts of mono- and dibasic thiocarboxylic acids of phosphorus. A method was developed for the synthesis of N,N-bis(dialkylthiophosphoryl-S-methyl)amides and 1,3,5,2-dithiaazaphorphorinanes by reaction of N,N-bis(chloromethyl)amides of carboxylic acids with salts of dithio- and trithiophosphoric acids, respectively. Inhibited rotation about the amide bond in the compounds was detected and quantitatively evaluated. Dithiaazaphorphorinanes exist in solution as an equilibrium between two conformers. References 5: 4 Russian, 1 Western.

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UDC 547.234.1+547.241+541.128

REACTION KINETICS OF DIPHENYLPHOSPHONIC ACID HYDRAZIDE WITH PHENYLISOTHIOCYANATE IN PRESENCE OF BENZOPYRIDINES

Leningrad ZHURNAL OBSCHEV KHIMII in Russian Vol 56, No 4, Apr 86
(manuscript received 27 Aug 85) pp 813-817

[Article by N.I. Yanchuk, Ternopol State Pedagogic Institute imeni Ya.A. Galan]

[Abstract] While studying the catalytic properties of benzopyridine in reactions of diphenylphosphonic acid hydrazide with phenylisothiocyanate in benzene at 25°C, it became evident that benzo derivatives of pyridine have a somewhat greater catalytic effect on the formation of phosphorus-containing semicarbazides in comparison to corresponding mononuclear pyridines having the same basicity and equal steric screening of the catalytically active site. This effect appears to be due to the higher polarity of the benzopyridines. substituents at the 2- and 2,6-positions in molecules of pyridine and its derivatives cause an appreciable decrease in catalytic effect due to steric screening of the catalytically active nitrogen atom. Figure 1; references 12: 10 Russian, 2 Western.

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H¹, C¹³, P³¹ NMR SPECTRA AND STRUCTURE OF SPATIAL ISOMERS OF 1-PHENYL-1-THIO(SELENO, OXO)-2,5-DIMETHYLPHOSPHORINANE-4-ONES

Leningrad ZHURNAL OBSCHEV KHIMII in Russian Vol 56, No 4, Apr 86
(manuscript received 12 May 85) pp 817-822

[Article by L.P. Krasnomolova, O.V. Agashkin, V.B. Rozhnov, A.P. Logunov and Yu.G. Bosyakov, Institute of Chemical Sciences, KaSSR Academy of Sciences, Alma-Ata]

[Abstract] Despite the vast amount of data accumulated thus far on the NMR method of structural analysis of six-membered phosphorus-containing heterocyclic compounds, specific spectroscopic correlations that can be used to establish spatial structure (ring conformity and orientation of exocyclic substituents) are still lacking. In the present work H¹, C¹³ and P³¹ NMR spectra of stereoisomers of 1-phenyl-1-thio(seleno, oxo)-2,5-dimethylphosphorinane-4-ones are presented. These spectra show that the isomers retain the same conformity in solution as that recorded by X-ray analysis in the crystal state. The specific features of the H¹ and C¹³ NMR spectra are due to the phenyl group at the phosphorus atom. The value of the J³ (PH)

constant for the "twist" conformation is distinctly different from that of the "chair" conformation. Tables 5; references 13: 6 Russian, 7 Western.

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UDC 547.241

NITROSYLATION OF DIETHOXYPHOSPHONYLACETIC ACID CHLORIDE

Leningrad ZHURNAL OBSSHCHYEY KHIMII in Russian Vol 56, No 4, Apr 86
(manuscript received 1 Jul 85) pp 957-958

[Article by B.A. Kashemirov, A.D. Nikityuk, Yu.A. Strepikheyev and P.S. Khokhlov, Moscow Chemical-Technologic Institute imeni D.I. Mendeleyev]

[Abstract] In continuation of a study of the nitrosylation of organophosphorus compounds having an active methylene group, it was found that nitrosyl chloride reacts with diethoxyphosphonylacetic acid chloride to form hydroxyimino compounds which can react with alcohols to yield esters of diethoxyphosphonyloxyiminoacetic acid. The course of the reaction can be monitored by disappearance of the PCH_2 doublet in the PMR spectrum with excess acid chloride. References 3 (Russian).

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PESTICIDES

USES, DANGERS OF HERBICIDE FALLOWS

Moscow KHIMIYA I ZHIZN in Russian No 5, May 86 pp 28-29

[Article by N.M. Melnik, candidate of agricultural sciences: "Technology and Nature: The Pluses and Minuses of 'Herbicide Fallovs'"]

[Text] What we are talking about is poisons. I do not mean the devilish concoctions that the grandees of the middle ages fed each other nor the chemical agents used to control pests although the latter is closer to the subject. What we are concerned with are poisons, the "grass killers", hence herbicides (from the Latin herba for grass and caedo for kill), substances that destroy weeds but do not in any way affect the normal growth of cultivated crops. These can also be regarded as poisons of selective action.

The history of herbicides began in the early 20th century when it was found that some copper and iron salts killed broad-leaved weeds in grainfields. By the 1940's, the herbicidal effects of several organic compounds had already been studied. It became clear that even small amounts of these agents can destroy weeds and prevent them from re-emerging.

Modern herbicides are complex organic compounds composed of chlorine, phosphorus, mercury and other elements. According to their chemical properties, they can be classified in one of several large groups: carbamide derivatives, displaced phenols, halogen-displaced organic acids and others. Inorganic compounds are no longer used much.

When used in their recommended doses, most herbicides are harmless to man and animals but out of the more than a thousand herbicidal substances in existence, only 100 are allowed for use in our country. Their use is relatively simple: herbicides are dissolved in water and then sprayed on the soil and plants. About 5 kilograms of dry pesticide is enough to treat a hectare of cropland.

Chemical weeding has made it possible to considerably reduce the work-intensiveness for soil treatment. The necessary depth of soil loosening is also reduced. Less energy-consuming methods than plowing can then be used to cultivate fields and in some cases, mechanical preparation of the soil can be dispensed with for years.

"Zero" Treatment

In sufficiently moist zones, the ground is covered by vegetation. Soil loosening destroys that cover for only a short while and after one or two weeks, the ground is again covered by dense shoots. Chemical destruction of the weeds is entirely different: the soil is denuded without being turned over and remains bare for several seasons. The unusual and previously-unknown soil condition is known as herbicide fallow.

Such "zero" treatment of the ground is widely used in fruit nurseries and orchards and on fruit farms. It is effective in improving the quality of meadows and pastures.

What happens in soil whose vegetation is artificially removed? Above all, the broken up soil begins to settle and condense. On the surface is formed a crust that can reach a depth of 1.5 centimeters in the summer. This crust stops water from penetrating the soil and makes it difficult for the upper layers of the humus level to breathe. However, as time passes, the crust becomes covered with cracks and numerous soil-dwelling animals dig tunnels and holes in it. At a depth of 10-18 cm, its structure is even looser than after cultivation or harrowing. Aside from that, under "zero" treatment, there are more dirt clods of 1-3 cm diameter. The more of these found in the soil, the less leaching occurs. The positive effects that chemical weeding has on the physical properties of the soil has been confirmed by experiment: after "zero" treatment, loess loam absorbed 3.5 times more water than soil periodically turned over.

Herbicides also affect soil microorganisms. For example, when simazine is introduced, the soil often turns light gray instead of light grayish-brown. This phenomenon is caused by the death of green algae which, regardless of their name, are found not only in water but also usually inhabit soil surfaces. With the death of herbaceous plants, the source of organic substances disappears. There decreases the number of fungi, actinomycetes and cellulose-digesting bacteria. The denuded soil and the air layer over it heat up more and dry out faster which in turn affects the cold-blooded organisms inhabiting the field. As the amount of vegetative matter decreases, so does the number of earthworms. A general drop in biological activity is observed. The soil gradually loses its fertility.

Making "Herbicide Fallow" Harmless

That is the goal of studies which have been conducted over the last 10 years at the Mogilev Oblast Experimental Agricultural Station. As a result, it became possible not only to determine the negative affects that herbicides have on soils but also the means of countering them.

The damage caused by chemical weeding and the speed at which the soil equilibrium is regained largely depends on how much decayed vegetative matter remains in the soil. What about if organic substances are artificially introduced to the soil? For this reason, perennial lupine was grown in the space between rows of young orchards and the soil beneath the trees was

sprayed with herbicides to keep it free of weeds. The lupine was mowed by a mowing and threshing machine and the cuttings were then placed around the trunks of the trees.

Decayed vegetative matter left on the surface or worked in to a depth of 5-7 cm neutralizes the harmful effects that herbicides have on soil fertility. Under a layer of organic substances, the action of soil fauna is intensified. The surface crust is penetrated with numerous tunnels dug by earthworms which enrich the soil with the digestive products. The water permeability of the upper layers of the humus level is sharply improved. Vegetative remains help support algae including the types sensitive to herbicides. There is formed a reserve of mobile forms of phosphoric acid and exchangeable calcium. There are also activated the microorganisms that accumulate nitrates and therefore supply cultivated crops with nitrogen. Thanks to the growing biological activeness of the soil, the conditions are created for larger harvests while the cultivation costs are lowered.

This is a real means of reducing the adverse effects of chemical weeding and the search continues for others. The side effects of herbicides and compounds of high biological activeness should be kept in mind by farmers, soil scientists, agricultural chemists and microbiologists.

We began by speaking about poisons. For every poison there is an antidote. The effectiveness of that antidote depends not only on whoever found it but also on whoever uses it.

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PETROLEUM PROCESSING INDUSTRY

SIGNS OF INCREASING OIL PRODUCTION

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 13 May 86 p 2

[Text] The petroleum industry's situation is showing marked improvement. In comparison with the first month of Spring this year, oil production has in April increased by 8,234 tons per day and was 44,000 tons higher than December of last year.

Throughout the ministry as a whole, the April plan was 99.2-percent fulfilled and the country was short of about 400,000 tons of petroleum and natural gas condensate. The lag in production is understandably being very sharply felt. At the same time, it is impossible not to notice hopeful changes: in April, the gap between the planned and actual levels of production was nearly half of what it had been in March. In other words, there was a strong step forward toward fulfillment of the plan.

The leading petroleum and natural gas associations of the Ministry of Petroleum Production have fulfilled the plan by the following percentages:

Tyumen Chief Petroleum and Natural Gas	98.1
Nizhnevartovsk Petroleum and Natural Gas [Nizhnevartovskneftegaz]	100.0
Yuganets Petroleum and Natural Gas [Yuganskneftegaz]	100.3
Surgut Petroleum and Natural Gas [Surgutneftegaz]	103.3
Noyabrsk Petroleum and Natural Gas [Noyabrskneftegaz]	82.2
Krasnoleninsk Petroleum and Natural Gas [Krasnoleninskneftegaz]	101.2
Varyegan Petroleum and Natural Gas [Varyeganneftegaz]	86.6
Tatar Petroleum Association [Tatneft]	98.5
Bashkir Petroleum Association [Bashneft]	100.5
Komi Petroleum Association [Komineft]	104.9
Mangyshlak Petroleum Association [Mangyshlakneft]	100.7
Kuybyshev Petroleum Association [Kuybyshevneft]	100.4
Tomsk Petroleum Association [Tomskneft]	104.4
Perm Petroleum Association [Permneft]	100.5
Udmurt Petroleum Association [Udmurtneft]	100.7
Orenburg Petroleum Association [Orenburgneft]	100.4
Grozny Petroleum Association [Grozneft]	101.3
Turkmen Petroleum Association [Turkmenneft]	103.9
Ukrainian Petroleum Association [Ukrneft]	101.3

According to the results of four months of operation, the Surgut association's oil fields emerge as the leaders in production and have produced an above-plan surplus of about 200,000 tons of oil. They are followed in production by the fields of the Komi association. The oil-producers in the Krasnoleninsk Rayon of Tyumen Oblast, Bashkiria, the Udmurt ASSR, Perm Oblast and Mangyshlak have improved their output. The leading oilfields have sent an extra million tons of oil over and beyond the plan to processing plants.

As this newspaper has already reported, the largest oil-producing association, Nizhevartovskneftegaz, has made up for its great production lag of April. Every 24 hours, it is now turning out about 2000 tons of oil over and beyond its plan. In order to more quickly meet responsibilities, it is necessary to accelerate the introduction of new facilities at Samtor and adjacent oil deposits and see that every well is working under optimal conditions.

The shortage of workers for the oilfields of Tomsk Oblast felt since the start of the year has now been eliminated. In April, these fields produced somewhat more than 50,000 tons and this was the result of some active measures to intensify production.

The past month has again confirmed the sagacity of the well-known statement that petroleum is found "at the point of the chisel". A strong contribution to the increase in output was made by drilling teams that have drilled more than three million meters of shafts and fulfilled 113 percent of their plan.

This year, the industry's drilling operations increased by 25 percent. Oilfield workers have made solid progress with new facilities: more than 4000 new wells have been added to the network and this includes 2500 in Tyumen oblast alone. The RSFSR Ministry of Transportation's automobile industry workers provided the Tyumen oilfields with timely assistance in the form of the machines sent to Siberia to fill group sites [kustovye ploshchadki].

The petroleum industry's management has spoken with satisfaction about the great help provided by other industries. Many different establishments in the chemical and machine-building industries have fulfilled on time their responsibilities to oil producers. For example, the Siberians have received 3400 of the electrical loaders they so critically need while the plan called for 2900. However, the production schedules are not being kept with certain items of petroleum equipment. Only Glavtyumenneftegaz was provided by the machine-building industry with hundreds of sets of gusher fittings, a large amount of cranks, booms and hoists for well repair work.

In the chief oil-producing region of the country, they have now begun work to accelerate the introduction of fresh reserves. If one looks at the figures, it is obvious that the program is being successfully implemented. Over four successive months, 17 new names have appeared in the list of Siberian oil deposits and an additional four underground storerooms have been put into service. However, this, the most important reserve for increasing oil production in this region has still been poorly utilized. The task of selecting production from the new sites has still not been implemented. The deposits opened last year are being exploited only slowly.

One of the main causes of the low output of young fields is the lag in construction of electrical power plants and all-weather roads. In most cases, the schedules for electrical power generation are extremely unreliable. Subdivisions of Minenergo USSR are not keeping up with their planned construction of substations and power lines and this is hindering any increase in drilling and construction work.

May will not be an easy month for the petroleum industry, especially in Siberia. In the expanses of the northern Tyumen region, traffic along all-weather roads has been shut down and the transportation of people and equipment to the oilfields has been complicated. Under these conditions, using every minute of work time, good organization and discipline become most important. Unless work is well organized in this way, it will be impossible to fulfill the primary task of not only sustaining but increasing the growing rate of oil production in order to more quickly reach planned production figures.

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PHARMACOLOGY AND TOXICOLOGY

UDC 547.962; 541.64; 539.199

IMMOBILIZATION OF INSULIN ON POLYMER CARRIERS

Tashkent UZBEKSKIY KHIMICHESKIY ZHURNAL in Russian No 1, Jan-Feb 86
(manuscript received 3 Jun 85) pp 32-35

[Article by T.I. Kalendareva and S.Sh. Rashidova, Institute of Chemistry and Physics of Polymers, UzSSR Academy of Sciences]

[Abstract] Although much work has been published on immobilized proteins, the correlations of the chemical structures of the polymer-carrier and the natural compound to the effectiveness of the resulting system are not yet clear. A study was made of the relationship of the properties of a polymer-protein (insulin) conjugate to the type of bonding of polymer-carrier with insulin (ionic, coordinate, or covalent) immobilization. Gel chromatography of the products of ionic immobilization of insulin on polyelectrolytes showed two peaks identified as two types of polymer-protein complex. In the first type, the retention volume is less than that of vinylpyrrolidone-diacetalacrolein copolymer, while in the second, the retention volume is greater than that of free insulin. In the case of coordinate immobilization and the azide method (covalent immobilization), the first peak was identified as free polymer and the second as a polymer-protein complex with a greater retention volume than that of free insulin. Therefore, one of the factors which determine the effectiveness of a polymer-protein conjugate is the nature of the polymer-carrier. Figures 2; references 8 (Russian).

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POLYMERS AND POLYMERIZATION

UDC 678.743.22.046.36(088.8)

STUDY OF ADSORPTION REFINING WASTES OF COTTONSEED OIL FOR PRODUCTION OF FILLED POLYMERIC MATERIALS

Tashkent UZBEKSKIY KHMICHESKIY ZHURNAL in Russian No 1, Jan-Feb 86
(manuscript received 11 Jun 85) pp 60-62

[Article by A.K. Tursunov, Ye.P. Mamunya, Ye.V. Lebedev and E. Fatkhullayev, Institute of Chemistry of High Molecular Weight Compounds, UzSSR Academy of Sciences; Tashkent Order of People's Friendship Polytechnic Institute imeni Abu Rayhan Beruni]

[Abstract] Askanite clay (a bentonite bleaching clay), after having been used to refine cottonseed oil, contains 20-40% fats, oils and associated matter. A study was made of the possibility of using the spent clay as a filler for polymer compositions. Compositions of high density polyethylene and the spent clay were extruded at 420K and tested. The properties of the test samples show that the spent clay can be used as a filler and that the structure of materials containing it has fewer defects and is therefore shock resistant. Figures 3; references 9: 8 Russian, 1 Western.

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RUBBER AND ELASTOMERS

UDC 678.762.2-134.622.2.532:543.226

STUDY OF SHORT-TERM HIGH TEMPERATURE EFFECT ON QUALITY OF BUTADIENE-NITRILE
AND BUTADIENE-STYRENE RUBBERS

Moscow KAUCHUK I REZINA in Russian No 4, Apr 86 pp 10-12

[Article by D.I. Moiseyev, Yu.K. Gusev, V.M. Potseluyev and V.S. Shein]

[Abstract] A rubber dried in a worm-wringer is subjected simultaneously to the effects of high temperature, pressure and mechanical loading, which results frequently in deterioration of properties owing to structurization, especially in the case of butadiene-nitrile rubbers. These rubbers normally remain in the drier from 2 to 4 minutes at 170°-230°C. Owing to the complexity of trying to correctly model all factors of the process, an attempt was made to clarify the effects of short-term, rapidly rising temperature alone on 3 butadiene-nitrile and 3 butadiene-styrene rubbers using differential thermal analysis, thermography and Ir-spectroscopy to record the changes taking place at 150°-250°C. The butadiene-styrene rubbers are less thermostable than the butadiene-nitrile. An outline of the processes is presented, but it is limited in scope since the effects of pressure and mechanical treatment are not included. Worm-wringing of SKN-18 (butadiene-nitrile) and SKS-30AKO (butadiene-styrene) is not desirable because of low temperature oxidation processes, while butadiene-styrene rubbers are subject to explosive evolution of volatile products. Figures 3; references 8 (Russian).

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PROSPECTS FOR USING SKI-5NTP FOR PRODUCTION OF ARTICLES FOR MEDICAL AND
FOOD USE

Moscow KAUCHUK I REZINA in Russian No 4, Apr 86 pp 12-14

[Article by V.A. Kornev, A.R. Makeyeva, Yu.L. Morozov and Ye.S. Guryeva]

[Abstract] A comparison of structural, molecular weight, plastic-elastic and other physicochemical characteristics of the new clear synthetic isoprene

rubber SKI-5NTP (synthesized over a lanthanoid catalytic system) with those of natural rubber and the serially produced SKI-35 shows that there is little variation in properties of the rubbers. Therefore, it is recommended that SKI-5NTP be used as a substitute for scarce imported natural rubber to fabricate products having medical and "food" designations. Figure 1; tables 2; references 3 (Russian).

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UDC 678.7(088.8)

RADIATION VULCANIZATION OF RUBBER MIXES BASED ON COMBINATIONS OF BUTADIENE-NITRILE AND CHLOROPRENE LATEXES

Moscow KAUCHUK I REZINA in Russian No 4, Apr 86 pp 19-21

[Article by T.G. Samoylenko]

[Abstract] The properties of a rubber mix based on a blend of different latexes depends on the heterogeneity of the mix and the interfacial interactions therein. It has been suggested that vulcanizates having optimum properties may be prepared by radiation treatment, so that the diffusion effects, associated with thermochemical curing, can be side-stepped. In the present work, the covulcanization of butadiene-nitrile (SKN-40) and chloroprene (Kr-50) latexes by gamma-radiation was studied. The results show that the Mooney viscosities of the latexes determine the properties of the rubber mix, the degree of crosslinking and the characteristics of the vulcanize. Figures 4; references 6 (Russian).

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UDC 678.7-9:543.544

CHROMATOGRAPHIC STUDY OF INTERACTION BETWEEN CARBOXYLATE LATEX AND EPOXY RESIN ED-20

Moscow KAUCHUK I REZINA in Russian No 4, Apr 86 pp 25-27

[Article by I.B. Tsvetkovskiy and V.I. Valuyev]

[Abstract] Although there has been much research on the reaction of carboxylate latexes with epoxy resins, there is still no simple answer to the question of whether homopolymerization of the epoxy resin runs parallel to the basic reaction between the carboxyl and epoxy groups, or whether it represents the second stage of a process commencing only after the depletion of carboxyl groups. In the present work, gel chromatography was

used to study the interaction between a butadiene-nitrile polymer and epoxy resin ED-20 at 80° with triethylene tetramine (TETA) as catalyst. The gel chromatography was conducted on a "Waters" Model 200 chromatograph with toluene as solvent. The results indicate that the initial stage of the reaction consists of the formation of epoxidized prepolymer with no appreciable homopolymerization of epoxy resin. During the second stage of the process, the vulcanizate is formed by curing of the prepolymer and the excess epoxy resin with the TETA. Figures 4; references 7: 6 Russian, 1 Western.

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WOOD CHEMISTRY

REORGANIZATION OF LUMBER INDUSTRY

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 20 May 86 p 2

[Article by M. Busygin, Minister of Forestry, Cellulose, Paper and Timber Industries: "Of Concern to All: The Minister On Reconstruction Within the Industry"]

[Text] I must say at once that we workers of the lumber industry need to reorganize more than any other industry. We have been behind for so long. Over the past 5-year period, the nation's supply of timber and other wood and paper products has fallen short by about 100 million cubic meters. For many directors and even rank-and-file workers and specialists, this lag has become a custom and a natural event. As always, they have their explanations and excuses: "Our supply of raw materials," they say, "has shrunk, new tree farms are being built too slowly, there are not enough lumbering roads and our equipment is too obsolete". There remains little else that they can use for justification.

I am convinced that the chief danger to our industry is actually posed by such attitudes. Our duty and shared cause is to abolish inertia and the feeling that many have that they have neither any responsibility or legal accountability for their deeds.

Therefore, that is what gives such great importance to the initiatives of the workers at Irkutsklesprom [Irkutsk Lumber Industry Association] (director -- G. Romanyuk), Karellesprom [Karelian Lumber Industry Association] (I. Sankin), Kostromlesprom [Kostroma Lumber Industry Association] (K. Averochkin), Sverdlesprom (Sverdlovsk Lumber Industry Association) (N. Lyashuk) and Tomlesprom (Tomsk Lumber Industry Association) (V. Shutov) who as early as the end of last year decided to make extensive use of socialist competition and to prepare and realize no less than one-quarter of the yearly plan by the beginning of the 27th CPSU Congress and 55 percent by 1 May. This initiative is well known to the employees of the lumber industry and has been approved by the CPSU Central Committee. It has been described in newspapers including SOTSIALISTICHESKAYA INDUSTRIYA. It is also known today that these responsibilities are being taken up with honor.

The initiative was adopted by not only much of the lumber industry but also by

workers in the paper and wood-processing industries and many other sub-branches. More than two million workers, engineers, technicians and others have been competing to reach new and higher boundaries.

Of course, this was not accomplished in and of itself. Much was done by managers and by party and union organizations to mobilize workers for intensive and high-efficiency work. Great attention was devoted to publicizing the competition, popularizing advances and innovations and introducing new systems for stimulating work to attain the final goal. However, I must repeat that the main point is the moral lesson and the practical working conclusion that this fact should present workers of the industry.

They can ask what there is to be excited about. We have reached the turning point and for the first in many years now, the industry has fulfilled the basic technical and economic indicators of its plan.

A turning point is a turning point but please take a look at the following figures. At the beginning of April, the Kirovlesprom Association brought out 30 percent and the Arkhangelslesprom Association 35 percent of the lumber that they had received in the last few days of March. This means that the intensity of work dropped by more than half in just two to three days. Is this because of the thaw conditions closing down the roads? No. of course not. This is the result of habit: the same inertia that still remains our chief enemy and obstacle to efficient and highly-productive work. Even today, many feel that it is possible to work seriously only three to four months per year, in winter. That, they say, is the work thing in this industry.

One can ask why the Karellesprom Association and a few others did not have a sharp drop in production. Does this mean that it is hard to work in the forests in summer and even more so in spring? The real problem here is that the directors of Kirovlesprom and Arkhangelsklesprom, G. Melnikov and V. Plokhov, and of many other plants were unable to overcome old habits within themselves and their subordinates and adjust their work to today's needs. But this must be done and done as decisively as possible.

In generalizing the experience of the leading associations, the ministry has worked out an additional set of measures to improve the work of the lumber industry. These measures have begun to be used in associations and plants.

This set of measures above all includes making full use of equipment. If we do not have enough equipment, then what we do have should at least operate at full capacity over no less than two shifts and better yet, three. Especially now that the days are longer. After all, the workers at Tyumenlesprom and Tomlesprom were able to work two and three shifts even during the winter. Why is it that their comrades in Arkhangelsk Oblast and Sakhalin Island cannot do the same?

It must be said that the following is an important psychological factor. Some people wonder why they must wear out a machine all spring and summer when it was so hard to get in the first place. They think that it would be better to

spare it for next winter. Such attitudes are seen as some form of thrift. But a careful attitude toward machinery is not leaving it idle and rusting but in operating it properly and taking good care of it.

A great reserve potential is found in every crew's dutifully performing its assigned production tasks. For now, every tenth group of workers is still behind in their work and that is only the average because many more than that are falling behind at Komilesprom, Gorkles [Gorky Lumber Industry Association] and Chitales [Chita Lumber Industry Association]. This again leads one to ask why it is that with the same equipment and under nearly the same conditions some workers fail to fulfill their quotas while others exceed them 150 percent. It is well known, for example, what sort of remarkable successes have steadily been achieved by the crews of P. Popov (twice Hero of Socialist Labor and a laureate of the USSR State Prize) from the Komsomol Tree Farm [lespromkhоз] of Tyumenlesprom, of USSR Supreme Soviet Deputy V. Pertunen (Karellesprom), S. Gazizov's cross-cutters (Bashles) and many others. What stops their colleagues from working that hard?

You start by asking a man why he cannot or does not want to to keep up with those who are the vanguard of the competition and he answers: "How can I keep up with them? They are the leaders. They have better forests and newer equipment. In general, everything is better for them".

Is it really that way? I am reminded of the experience of a leading crew foreman of the Terginovo Lespromkhоз in Arkhangelsk Oblast, G. Uglyumov. He had finally had enough of all this talk about thermal conditions and decided to make an experiment. He then went to the Levkovo Lespromkhоз in the same oblast. He selected an ordinary parcel of land, took the usual machines and began to work. As he later told me, the local lumber producers were hiding behind the trees to see what his secrets were but they did not discover any. In just one month's time, Uglyumov's crew turned out 150 percent more wood than the best local crews even though these tried as hard as they could. He did this solely through proper organization of work and a creative and earnest attitude toward the task.

This is certainly something that must be thought about not only by foremen and farm directors but also by party and trade union representatives.

There are still other qualities needed by lumber industry employees: flexibility, agility and the ability to find and use new and indispensable production potential. The lumber industry must work under approximately the same conditions as any other resource-exploiting industry. The reserves of raw materials in inhabited regions near major transportation arteries are continually being exhausted. We must continue to push east and north, create new plants and build new housing settlements. This is not a simple task. It must also be said quite directly that we, the directors of the ministry, in the 10th and 11th five-year periods have not done enough to solve our problems. Therefore, we are now in a situation in which it takes more than two hours to transport workers to a cutting site. We are trying to correct this. It has been decided that more new tree farms will be built every year.

Even in this, we need more time to make up for lags. On the other hand, the forests are already needed now. Under such conditions, work by special shifts can and does help.

I am firmly convinced that special shifts are now the best means we have of fulfilling the plan but what we also need is a stable and reliable force of workers. Our most immediate goal is to considerably increase the amount of work done by special shifts and to create well-built, portable housing settlements.

This year, we must already put to work no less than 520 special shifts that can provide 22 million cubic meters of lumber.

As you see, in order to improve the position we must work to put things in order and this must be done by everyone including us, the directors. We are now working to improve the industry's structure and are creating large-scale farms that will not only cut wood but will also replenish forests. We are also establishing strong working ties with the machine-building industries. All of this is being done to ensure that the national economy can be fully provided with all types of wood and paper products when it needs them.

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